Far Eastern Studies Vol.7 May 2008
Center for Far Eastern Studies, University of Toyama

Analysis of Unemployment During Transition to a Market Economy: The Case of Laid-off Workers in the Beijing Area

Jun MA[1] Hiroko IMAMURA[2] and Guo Qing ZHAO[3]

Abstract

Using self-gathered data and the hazard model, we analyzed the reasons laid-off workers in the Beijing area remained unemployed. For the laid-off workers who were eventually reemployed, we used the Tobit model to explain the change in wages between their pre- and post-layoff employment. The results of these analyses revealed that, although China's policy of laying off workers from state-owned enterprises without completely severing the relationship accelerated the establishment of a labor market to some extent, with prolonged time the laid-off workers are out of work, the policy was an obstacle to the labor-marketing effort. Moreover, it was an obstacle to implementing and improving an unemployment benefits system. They also showed that laid-off workers with worked experience under the traditional system need to be reeducated to enable them to adapt to the new economic environment as well as to be taught new skills, especially those workers who were managers. Additionally, the "lay-off" is not only a policy in special phase during the process of Chinese economic system reform, but also a special phenomenon, which is the structural unemployment revealed from Chinese economic system. This unemployment due to changes in industry structure means that the government must adopt a more active employment policy.

Keywords: *Transition Economy, unemployment duration, state-owned enterprises (SOE), reemployment, Chinese Economy*

1. Introduction

A recent phenomenon in China is the reemployment of workers who had previously been laid off. Under the previous economic regime, workers were generally employed for life, so the concept of being laid off was a foreign one. Now, with the introduction of capitalism in China, this concept is no longer alien. The government now faces the problem of helping laid-off workers find new jobs, and new policies are needed to promote reemployment.

We have investigated this problem using data we collected on laid-off workers in the Beijing area. From the microeconomics viewpoint, in this paper we address the behavior displayed by laid-off workers during their unemployment. The results should help policy makers in China better understand and address the problem of reemploying unemployed workers.

[1] Faculty of Economics, University of Toyama, 3190 Gofuku Toyama-city Toyama 930-8555, Japan, E-mail: majun@eco.toyama-u.ac.jp
[2] Center for Far Eastern Studies, University of Toyama, Japan
[3] The School of Economics, Renmin University of China, China

This paper is organized as follows. First, by surveying the latest related literature, we clarify the significance of and motivation for our research. Second, by comparing our surveys with macroeconomic data and micro surveys, we describe the characteristics and reliability of our surveys. Third, using estimates of the hazard function for the data of individual laid-off workers, we identify the factors contributing to more rapid reemployment of laid-off workers. Fourth, we use the Tobit model to analyze these factors and to analyze the change in income after reemployment. Finally, we address the policy implications of these results.

2. Literature Review

A country transitioning to a market economy often must face a high unemployment rate and lengthy periods of unemployment. Studies on these problems have generally concentrated on two things: the rates and durations are remarkably different in the country in the same transiting-economy. The analysis of these differences is not only an important function of transition economics but also an important source of information for policy makers.

During the transition, the government has to reduce its intervention in the marketplace and promote the development of a market mechanism. It must also implement an efficient social security system. However, these tasks are somewhat at odds. Therefore, searching for a policy that addresses both has been a challenge for both researchers and policy makers. A primary task is discussing the effects on the duration of unemployment of a passive employment policy (e.g., providing unemployment insurance) and of an active employment policy (e.g., providing occupational training for unemployed workers). Although a passive employment policy provides social security for a more successful transition, it increases government intervention and spending, which degrades economic efficiency and seduces the moral hazard of unemployed workers. Although an active employment policy promotes the labor-marketing effort, whether the unemployed can be reemployed depends somewhat on the effectiveness of the training. A discussion of the factors affecting the unemployment duration should provide basic information useful to the development of an appropriate policy.

Using the hazard model and data on unemployed workers registered at labor offices, Ham et al. (1998) analysis comes from their Oaxaca-type decomposition of the difference in the (non-liner) expected unemployment duration between the Czech and Slovak republics. With the average unemployment spell being four times longer n Slovakia than the Czech Republic, the authors find that nearly one-third of this difference is explained by differences in observable demand conditions and the industrial employment structure in the

two republics. The remaining two-thirds are accounted for by the different behavior of firms, individuals and institutions in the labor market, as reflected by differences in the coefficients of the hazard functions. Very little of the difference in expected unemployment duration comes from differences in the demographic variables between the two republics.

As a country transitioning to a market economy, China confronts the questions of how to realize labor-marketing and how to design a social security system. In the mid-1990s, China started to gradually layoff workers who were made redundant by the reform of state-owned enterprises (SOEs). Although these workers left their workplace, they still maintained a relationship with their company, and the government encouraged them to find new jobs. During the reform, the government opened employment service centers, paid laid-off workers an allowance, provided professional training, and recommended jobs. Since the laid-off workers maintained a relationship with their company, the statistical data on unemployment did not include them. Hu (1998) addressed the relationship between the number of laid-off workers and the official unemployment rate in China from the macroeconomic viewpoint. He calculated the number of unemployed workers and the true unemployment rate. As shown in figure 1, a large proportion of the unemployed workers were laid-off workers, especially from 1998 to 2000, when the proportion was greater than 50%. Laid-off workers were thus a significant portion of the unemployed during China's transition.

This special layoff policy during the reform of China's economic system and the development of China's economy had a dualistic nature. On the one hand, workers who had once enjoyed lifetime employment were dismissed from their jobs and pushed into the labor market, which promoted labor-marketing. On the other hand, the contract between the workers and the enterprises was not broken and is often intervened by government. Therefore, during the imperfection of the unemployment benefits system, the government also provided unemployment security. The question then is what is best behavior that of the laid-off workers under this special layoff policy? That is, what were the results of the layoff policy? Did it promote labor-marketing? Did it improve unemployment security? Or did it do both? Analysis of these questions should provide not only a factual basis for evaluating the measures taken by China during the reform of its economic system but also provide a theoretical basis for designing a policy that promotes labor-marketing.

Figure 1 Number of unemployed workers and unemployment rate including laid-off workers

Source: 1993–1995: Chinese Academy of Sciences, 1998, p. 106. 1996–2000: China Labor Statistical Yearbook (1997 to 2001)

3. Characteristics and Reliability of Surveys Used

Many China scholars, from various points of view, have used field surveys and questionnaire surveys to analyze the special layoff policy, i.e., the special unemployment phenomenon in China and the policy measures taken to promote reemployment of laid-off workers. Many scholars have also performed simple statistical analysis. For example, the Task Team of the Institute of Labor Science (2000), which is affiliated with the Ministry of Labor and Social Security, used the results of field surveys and questionnaire surveys of enterprises and laid-off workers in 17 Chinese cities to analyze the relationships between laid-off workers and SOEs and to analyze the rate of reemployment. They found that SOEs laid-off about 1.7 million workers, which is more than the official number. As the number of laid-off workers increased, reemployment became more and more difficult, and the higher the age of a worker, the lower the rate of reemployment. Mo and Yue (2001) used sample data from the questionnaire surveys to analyze the reemployment of laid-off workers. They found that the laid-off workers were more likely to be women, older workers, workers with a lower level of education, to have worked for an SOE or a manufacturing company, to have been the ordinary workers, and the lower income families. They also found that nearly half the laid-off workers found new jobs, that men were more competitive and enterprising than women, that younger laid-off workers had an advantage in terms of reemployment while older laid-off workers had an advantage in terms of self-employment, and that laid-off workers with no more than a middle school education

were more likely to become self-employed after being laid off. Those with a high school education accounted for most of the laid-off workers who set up their own enterprise while those with at least a junior college education were the most likely to be reemployed by an enterprise. In general, the laid-off workers who were reemployed were most likely to be employed by private enterprises and to be engaged in the tertiary industry. Finally, the community service was the most impotent field for those laid-off workers who became self-employed or set up a new business.

In addition, a survey conducted in Beijing by the Team of Study for China's Cities and Towns Labor Mobility (2002) showed that the laid-off workers had several characteristics in particular. The layoff rate for women was approximately twice that for men (8.9% vs. 4.5%). About 70% were between 26 and 45 years old, and about 60% were between 36 and 45 years old. More than 60% had worked in manufacturing. More than half had no more than a middle school education, and, on average, their education level was lower than that of the non-laid-off workers. About 60% had either never switched jobs or had switched jobs only once before being laid off. The layoff period for more than half of them was between 18 and 24 months.

A search of the relevant literature revealed no reports of an econometric model being used to analyze the unemployment duration or the effects of their reemployment. It also revealed no reports of a microeconometric model being used to analyze the data for individual laid-off workers. We have used self-gathered data for laid-off workers in Beijing who were eventually reemployed to conduct econometric analysis of the unemployment duration and the factors that affected the change in their income after reemployment. We used the results of the analysis to investigate the effects of the special layoff policy.

In October 2001, we conducted a survey of laid-off workers in Beijing by random sampling and collected 1214 usable questionnaires[4]. Most of the statistical properties of the sample were basically consistent with those of previous surveys. The ratio of men to women was 42.9: 57.1. About 90% of the workers were between 26 and 45 years old, 77% were between 36 and 45 years old. Most of the enterprises that had laid-off the workers were large or medium-size SOEs founded between 1949 and 1978. More than 70% of the reemployed workers found work in manufacturing. About 66% had a high school education. About 66% had worked for at least 15 years. At the time of the survey, more than half of the workers had been out of work for one to three years.

[4] The questionnaire survey was also administered to laid-off workers in Shanghai, Shenyang, and Lanzhou. The data for Beijing was used because it has the strictest government regulation as Beijing is the capital of China. Moreover, the function of the market is the weakest in the whole country.

According to the China Statistical Yearbook, of the 74,473 laid-off workers of Beijing in 2000, 63% were women, 67% were between 35 and 46 years old, and more than half had no more than a middle school education. Comparison of these basic statistical properties with ours confirms the credibility of our data.

4. Factors Contributing to More Rapid Reemployment of Laid-off Workers

4.1 Econometric Model

We used the hazard model to analyze the layoff duration. This model is often used in the microeconometric analysis of labor economics to analyze the factors that affect the unemployment duration. In this section we introduce the theoretical background for applying the hazard model to the unemployment duration. Mortensen (1986) discussed the relationship between the hazard model when it is applied to the unemployment duration and the theory of job search and conducted a literature review on the foundation and application of this model. Here we use the basic idea of the hazard model to discuss the whole course of transitioning from being laid off to becoming reemployed. We assume that laid-off workers fall into only two categories: those who are unemployed and seeking work (indicated by u) and those who have found new employment (indicated by e). Retreat from the labor market is not considered. For the convenience of analysis, we make several more assumptions.

(1) Enterprise F provides several employment opportunities with a wage level of w (with distribution function $p(w)$) for laid-off workers, and a certain proportion of the laid-off workers (η) can obtain one of these opportunities. The probability that a laid-off worker can obtain one of these job opportunities during a short time interval is $\eta\Delta$. The number of opportunities and the distribution of the wage level ($p(w)$) are independent. Each worker knows the distribution of $p(w)$ but not the actual wage level offered by an enterprise.
(2) During the unemployment duration, the utility level of laid-off workers is v_u, and it is independent of the wage level provided by the enterprise and of the distribution of $p(w)$. It does not change with the unemployment duration.
(3) The utility of laid-off workers after reemployment is a function of the wage level: $v_e = v_e(w)$. It is independent of the probability distribution of job opportunities.
(4) There is diminishing marginal utility, i.e., $dv_e/dw > 0$.
(5) The time when laid-off workers are given a job opportunity is random, and they can accept or reject it.

Under these assumptions, the optimum behavior of laid-off workers can be described by the strategy with a reservation wage. That is, a laid-off worker with reservation wage w^* will accept a job opportunity if the offered wage level is higher than w^*. Otherwise, the worker will decline the opportunity and continue searching for a job. The expected utility level of reemployment is an increasing function of the wage level and is independent of the wage levels that are not accepted. If, at wage level w, a laid-off worker prefers employment to unemployment, the worker will also prefer employment to unemployment at wage levels exceeding w. The w^* is the wage level at which the worker is indifferent between employment and unemployment. Therefore, the probability of a job opportunity being accepted by a laid-off worker is the probability that the wage level is higher than w^*. The probability can be defined by

$$\pi = \int_{w^*}^{\infty} p(w)dw \quad . \tag{1}$$

The probability of transitioning from unemployment to reemployment depends on the probability of a reemployment opportunity being accepted by a laid-off worker. That is, the hazard function of the unemployment duration distribution is

$$\lambda = \eta\pi \quad . \tag{2}$$

However, the function does not contain the observed value and a variable that represents the unemployment duration. We thus define the distribution of the unemployment duration for laid-off workers by using the log-logistic hazard function:

$$\lambda(x_i, t) = \frac{\beta' x_i \alpha t^{\alpha-1}}{1 + \beta' x_i t^{\alpha}} \quad . \tag{3}$$

The survivor function is

$$S(x_i, t) = \frac{1}{1 + \beta' x_i t^{\alpha}} \quad . \tag{4}$$

We use the maximum likelihood estimation for the survivor function to estimate the effects of various factors on unemployment duration. This regression model contains explanatory variables for the factors that affect the job opportunity offered to laid-off workers and those that affect the acceptance of a job opportunity.

4.2 Model Application

From the data collected in our questionnaire surveys, we extracted the date when each worker was laid off and the date of reemployment. We then calculated the unemployment duration. This duration reflects the speed of reemployment: the longer the duration, the lower the speed of reemployment.

We then applied Kaplan-Meier survival curves to the data. We found that, for heterogeneous laid-off workers, the unemployment duration for about 50% of the workers was greater than four years (see Figure 2) and that the proportion of men decreased over time (see Figure 3). This shows that the men were more quickly reemployed than the women. We also found that the duration of the unemployment differed between workers who were between 36 and 45 years old and those who were above 46 years old (see Figure 4). Laid-off workers who were less than 35 years old had the shortest duration. Furthermore, the duration for laid-off workers whose education level was high school and above was, as expected, shorter than that of workers whose level was middle school and below (see Figure 5). That is, the education level affected the speed of reemployment.

Next, we analyzed the factors that affect the laid-off duration (or the speed of reemployment). In the questionnaire surveys, we classified these factors into six categories: (1) basic personal state of the laid-off workers; (2) enterprise state of the workers before being laid off; (3) work state of the workers before being laid off; (4)
work state of the workers after being reemployed; (5) enterprise state of workers after being reemployed; (6) present work state of the workers.

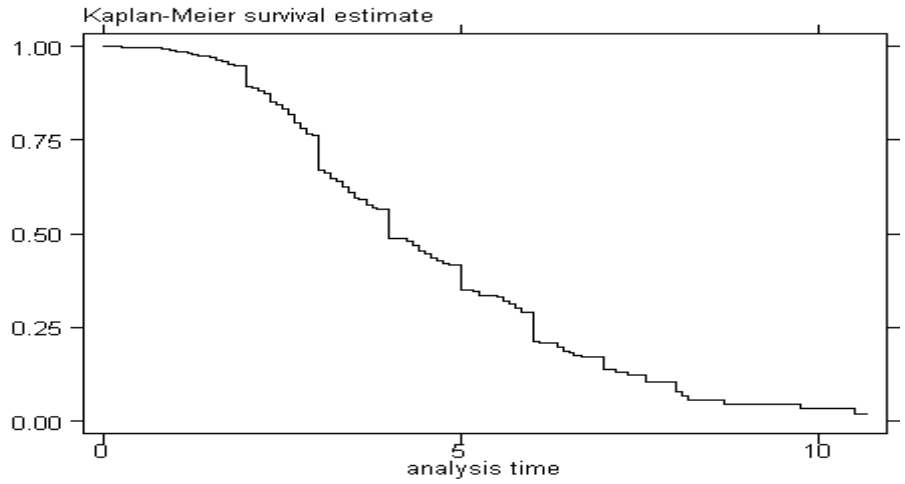

Figure 2. Change in unemployment duration for sampling of laid-off workers

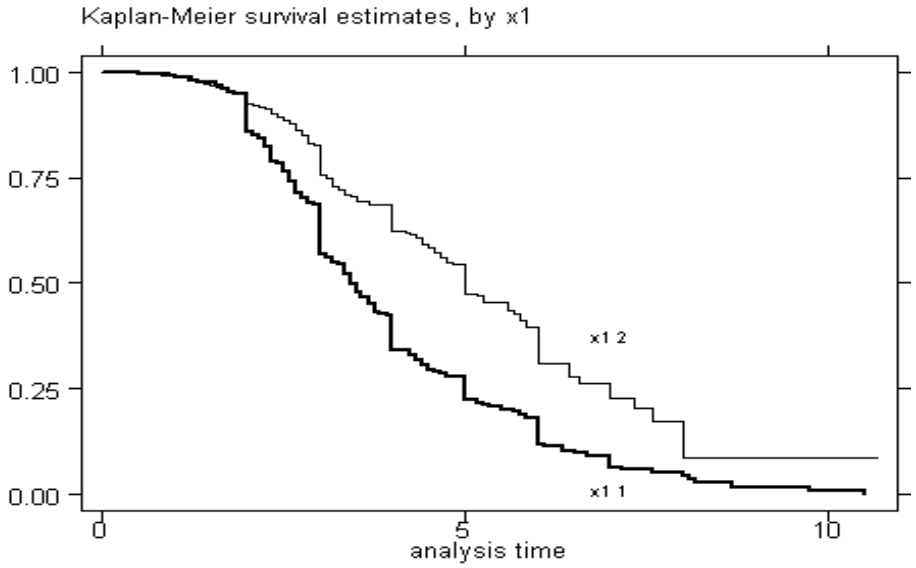

Figure 3. Change in unemployment duration by sex for sampling of laid-off workers

Note: "x11", "x12" indicate men and women, respectively.

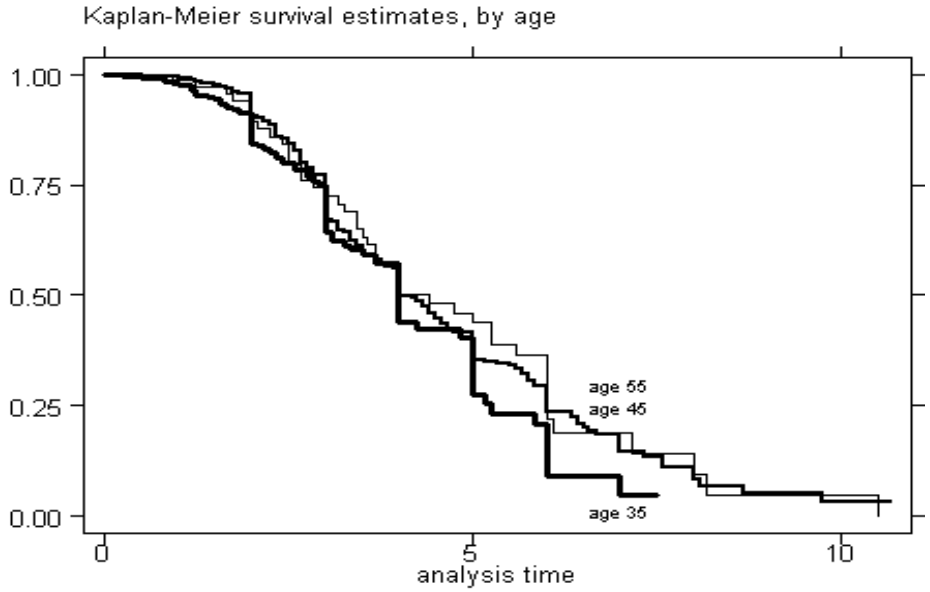

Figure 4. Change in unemployment duration by age for sampling of laid-off workers

Note: "age 35", "age 45", and "age 55" indicate below 35 years old, between 36 and 45 years old, and above 46 years old, respectively.

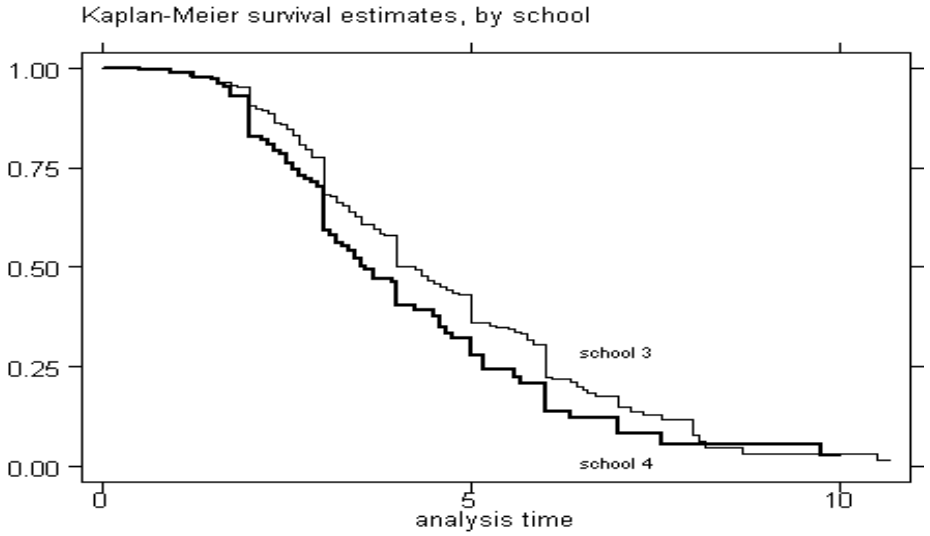

Figure 5. Change in unemployment duration by education level for sampling of laid-off workers

Note: "school3" and "school4" indicate middle, and high school and above, respectively.

First of all, we consider how the factors in the "enterprise state of the workers before being laid-off" category affect the unemployment duration. These factors are the enterprise size, the ownership form, the industry and the management situation of the enterprise, the founding date of the enterprise, and so on. Regulations require that the laid-off workers register with the reemployment service center of their original enterprise, draw unemployment compensation from the center, and take part in reemployment training offered by the center. The original enterprise must help its laid-off workers find new jobs. This means that the factors in this category partly determine the ability of the enterprise to provide reemployment opportunities to laid-off workers. Of course, the financial capacity and willingness of the original enterprise to pay unemployment compensation to its laid-off workers affects their utility levels, reservation wages, and so on. The enterprise's size, ownership form, and management situation determine its capacity and willingness to pay unemployment compensation to its laid-off workers. Since these factors have dual effects, we can use regression analysis to determine which effects are significant. We designated several of the original enterprise factors (size, ownership form, industry, management situation, and founding date) as dummy variables for the analysis.

We classified enterprise size into five intervals: 100 employees or less, 101 to 300, 301 to 1000, 1001 to 2000, and above 2000. We suspect that the size partly affects unemployment duration, but whether the effect is positive or negative is a question to be answered. For example, a large enterprise may be more concerned about the welfare of its laid-off workers, so it would be more willing to open a reemployment service center and to provide more generous unemployment compensation in a timely manner. On the one hand, the reemployment center would support their efforts to find new employment, which would

tend to shorten the unemployment duration. On the other hand, the compensation would reduce their motivation to find new employment, which would tend to lengthen the unemployment duration. Using econometric analysis, we investigated how enterprise sizes affect the unemployment duration. To analyze the effect of size, we set dummy variable Fsize to 1 if the size was 300 or less and to 0 if it was above 301.

We classified enterprise form as SOE, collective enterprise, private enterprise, joint venture enterprise, joint-stock enterprise, or other. Most of the laid-off workers had worked for an SOE, and the workers laid off from SOEs were likely to have received better treatment than those laid off from the other types of enterprises in terms of housing, medical treatment, compensation, etc. This better treatment may have affected their motivation to find new employment. To analyze the effect of form, we set dummy variable Fform to 1 if the enterprise was an SOE and to 0 otherwise.

We classified the industries into 12 types in accordance with the division standard of State Statistical Bureau of the People's Republic of China. Since previous studies have shown that laid-off workers are mostly from manufacturing, we analyzed the effect of the enterprise being a manufacturing one on the unemployment duration in relation to that of the other types of industries. To analyze the effect, we set dummy variable Findu to 1 if the industry was manufacturing and to 0 otherwise.

We classified the enterprise condition as very good, good, fair, slight deficit, severe deficit, being acquired, shut down, or bankrupt. The condition of the original enterprise should it affect its treatment of the laid-off workers and thus affect their motivation to find new employment. To analyze the effect, we set dummy variable Fcond to 0 if the condition was very good, good, or fair and to 1 otherwise.

We assume that, given the distinct differences between the various stages in the development of the economic system in China, enterprises founded in different stages have different aims. For example, those founded in the early years would tend to be more paternalistic while those founded more recently would tend to be more focused on the bottom line. These differences may lead to differences in the unemployment duration. We grouped the enterprise founding dates into five intervals: before 1949, 1950 to 1965, 1966 to 1978, 1979 to 1989, and after 1990. We defined 1978 as the dividing line and compared the effect of the enterprise being founded before 1978 on the unemployment duration with that of it being founded after 1979. We set dummy variable Ffoun to 1 if the enterprise was founded before 1978 and to 0 otherwise.

In addition, personal information on the laid-off workers and their situation prior to

being laid-off likely affected their unemployment duration. We thus defined variables for several types of personal information, including gender, age, and marital status, and defined seven variables for their pre-layoff situation before being laid-off: education level, length of work experience, type of work done, position in the original enterprise, work experience in the original enterprise, employment status (full-time, part-time, etc.), and income. Table 1 summarizes the definitions and settings of all the variables used.

As mentioned above, surveys have shown that men can generally find reemployment more easily than women. A negative coefficient for our estimation would support this. We thus set Gender to 1 if the surveyed individual was female and to 0 otherwise.

Several studies have shown that laid-off workers with a high school or higher education can generally find reemployment more easily than those with a middle school or lower education. We thus used two dummy variables to analyze the effects of education level on the unemployment duration. School1 reflects the low education levels and was set to 1 for middle school or below and to 0 otherwise. School2 reflects the high education levels and was set to 1 for junior college or higher and to 0 otherwise.

To analyze of effects of a change in the type of work done on the unemployment duration, we classified the type of work done into (1) skilled works and (2) other. If the reemployed workers who did skilled works at the present enterprise had had a shorter unemployment duration than those who did other work, we can conclude that the change in the type of work done did not affect the duration. If the reemployed workers who did skilled works had had a longer or the same unemployment duration as those who did other work, we can conclude that the change did affect the duration. We set dummy variable Ljob to 1 if the worker did skilled workers and to 0 otherwise.

Table 1. Variable definitions and settings.

Variable	Definition	Setting
Gender	Male or female	Dummy variable: woman = 1; man = 0
Age	Age	Age at time of survey
Age2	Square of age	= age × age
Fage	Interaction effect of sex and age	= gender × age
School1	Low education level	Dummy variable: middle school and below = 1; high school and above = 0
School2	High education level	Dummy variable: junior college and above = 1; otherwise = 0
Mstatus	Marital status	Dummy variable: married = 1; single = 0
Genderm	Interaction effect of sex and marriage	= Gender × Mstatus
Fsize	Size of original enterprise	Dummy variable: less than 300 employees = 1; 300 or more employees = 0
Fform	Form of original enterprise	Dummy variable: SOE = 1; otherwise = 0
Findu	Industry of original enterprise	Dummy variable: manufacturing = 1; otherwise =0.
Fcond	Condition of original enterprise	Dummy variable: very good, good, or fair = 0; otherwise = 1
Ffoun	Original enterprise founding date	Dummy variable: before 1978 = 1; otherwise = 0
Ljob	Type of work done at original enterprise	Dummy variable: skilled workers = 1; otherwise = 0
Lexp	Total length of work before unemployment	Period of work before being laid off
Llenth	Length of work in original enterprise	Period of work in original enterprise before being laid off
Lpos	Position in original enterprise	Dummy variable: management staff = 1; otherwise = 0
Lstat	Employment status in original enterprise	Dummy variable: permanent position or long-term contract with original enterprise = 1; otherwise = 0
Learn	Income before being laid-off	Monthly income before being laid off
Ldur	Duration of unemployment	From start of lay-off to time of survey
Nfsize	Size of present enterprise	Dummy variable: less than 300 employees = 1; 300 or more employees = 0
Nfform	Form of present enterprise	Dummy variable: SOE = 1; otherwise = 0
Nfindu	Industry of present enterprise	Dummy variable: manufacturing = 1; otherwise = 0.
Nfcond	Condition of present enterprise	Dummy variable: very good, good, or fair = 0; otherwise = 1
Nffoun	Present enterprise founding date	Dummy variable: before 1978 = 1; otherwise = 0
Nllenth	Length of work in present enterprise	Period of work after being reemployed
Nljob	Type of work done at present enterprise	Dummy variable: skilled workers = 1; otherwise = 0
Nlpos	Position in present enterprises	Dummy variable: management = 1; otherwise = 0
Nlstat	Employment status in present enterprise	Dummy variable: permanent position or long-term contract = 1; otherwise = 0
Nlearn	Income in present enterprise	Monthly income after being reemployed
Remp	Reemployment	Dummy variable: reemployed workers = 1; otherwise = 0

Note: “original enterprise” is enterprise before being laid off; “present enterprise” is enterprise after being reemployed.

Determining whether the know-how obtained by managements under the planned economy can be applied to management under the market economy is an important task during the China's transition to a market economy. We set dummy variable Lpos to 1 if the laid-off worker had been a manager and to 0 otherwise. A negative coefficient for this variable would show that the know-how can be applied. If it is positive or zero, it cannot be applied.

The laid-off workers had different employment status and accordingly received different treatments before being laid off. These differences likely affected their motivation to find new employment. We set dummy variable Lstat to 1 for laid-off workers who had been permanent employees or who had had long-term contracts and to 0 otherwise.

In short, the regression equation had 18 variables: Gender, Age, Age2, Fage, School1, School2, Mstatus, Genderm, Fsize, Fform, Findu, Fcond, Ffoun, Ljob, Lexp, Lstat, Lpos, Learn. Table 2 shows the basic sample statistics for each variable.

Table 2. Basic sample statistics for each variable

Variable	Number of	Average	Standard	Minimum	Maximum
Gender	1214	0.571	0.495	0	1
Age	1214	39.309	4.478	22	56
Age2	1214	1565.223	344.971	484	3136
Fage	1214	21.790	19.140	0	50
School1	1214	0.187	0.390	0	1
School2	1214	0.047	0.212	0	1
Mstatus	1214	0.942	0.235	0	1
Genderm	1214	0.547	0.498	0	1
Fsize	1214	0.179	0.383	0	1
Fform	1214	0.647	0.478	0	1
Findu	1214	0.721	0.449	0	1
Fcond	1213	0.728	0.445	0	1
Ffoun	1214	0.833	0.373	0	1
Ljob	1214	0.757	0.429	0	1
Lexp	1214	19.043	5.044	2	36
Llenth	1214	16.375	4.937	2	36
Lpos	1214	0.152	0.359	0	1
Lstat	1214	0.592	0.492	0	1
Learn	1214	736.279	213.913	100	3000
Ldur	1214	3.177	1.542	0.17	10.67
Nfsize	574	0.777	0.417	0	1
Nfform	574	0.082	0.274	0	1
Nfindu	574	0.287	0.453	0	1
Nfcond	574	0.033	0.179	0	1
Nffoun	574	0.138	0.345	0	1
Nllenth	574	2.081	1.168	0.08	9.75
Nljob	574	0.333	0.472	0	1
Nlpos	574	0.226	0.419	0	1
Nlstat	575	0.019	0.137	0	1
Nlearn	574	793.949	505.029	240	6000
Remp	1214	0.472	0.499	0	1

4.3. Results

We used the log-logistic hazard function described in section 4.1 for regression analysis of the factors that affected the unemployment duration of the laid-off workers. The estimated parameters are summarized in Table 3.

Table 3. Estimated parameters for unemployment duration

	(1)		(2)	
Explanatory variable	Estimated coefficient	Z value	Estimated coefficient	Z value
Gender	0.3417	1.0500	0.2376	0.8010
Age	0.0909*	1.8460	0.1104**	2.3940
Age2	0.0000	0.0480	−0.0002	−0.3710
Fage	−0.0119	−1.3840	−0.0071	−0.9130
School1	0.1095**	2.1680	0.0753*	1.7040
School2	−0.1087	−1.3400	−0.0410	−0.5650
Mstatus	0.0012	0.0130	0.0381	0.4670
Genderm	0.3510**	2.4640	0.2946**	2.3070
Fsize	0.0010	0.0190	−0.0011	−0.0230
Fform	−0.0448	−1.1180	0.0168	0.4730
Findu	0.0791**	2.0150	0.0531	1.5140
Fcond	0.0670*	1.6790	0.0400	1.1310
Ffoun	−0.0571	−1.0800	0.0341	0.7180
Ljob	−0.0238	−0.5220	0.0098	0.2430
Lexp	−0.0803***	−9.0930	—	—
Llenth	—	—	−0.0934***	−12.2800
Lpos	−0.0335	−0.6220	−0.0052	−0.1090
Lstat	0.1567***	4.1080	0.1658***	4.8570
Learn	−0.0002**	−2.3970	−0.0002**	−2.0220
Const	−0.7741	−0.8040	−1.3722	−1.5110
	Number of observations = 1213		Number of observations = 1213	
	Number of failures = 572		Number of failures = 572	
	Log likelihood = −629.05		Log likelihood = −592.93	

Notes: *, **, and *** indicate significance level of 10, 5, and 1%, respectively.

(1) The regression coefficients for the age variable (Age) and the education level variable (School1) are greater than zero. This means that, assuming the other variables are fixed, the older the laid-off worker and the lower the education level, the longer the unemployment duration.

(2) The regression coefficients for the gender variable (Gender) and the marriage status variable (Mstatus) were not significant, but the regression coefficient of the interaction effect of sex and marriage variable (Genderm) was significantly greater than zero. Therefore, the marital status affected the unemployment duration only for married women.

(3) The variables that reflected the industry of the original enterprise (Findu) were all greater than zero, but the size, form, and founding date of the enterprise had not significant effects.

(4) The regression coefficient for the length of time worked before being laid off (Lexp) was significantly less than zero, and that for the length of time worked in the original enterprise (Llenth) was also significantly less than zero.

(5) Whether the former job of a reemployed worker was skilled workers (Ljob) or management (Lpos) did not significantly affect the unemployment duration.

(6) The regression coefficient for previous employment status (Lstat) was significantly greater than zero. This means that the laid-off workers who had had permanent positions or long-term contracts had longer unemployment durations than the other laid-off workers.

(7) The regression coefficient for income before being laid off (Learn) was significantly less than zero. This shows that the higher the income before being laid-off, the shorter the unemployment duration.

5 Use of Tobit Model to Analyze Factors and Change in Income after Reemployment

5.1. Econometric Model

The above analysis of the factors affecting the unemployment duration revealed that the laid-off workers who were younger, had a higher education levels and a longer experience, and had a higher ability finding new jobs more quickly. However, even if workers found new employment, their incomes were lower than before the layoff, the reemployment was lower level. That is, the standard of living was lower, which resulted in a loss to the human capital. We thus conducted a regression analysis of the factors that affected the income change to clarify an effect of the reemployment. The results should provide basic information for designing a suitable policy for providing unemployment insurance and appropriate occupational training of unemployed workers.

In econometrics, model analysis on the income of employed workers usually uses a censored sample, but ordinary least-squares estimations of a censored regression model generate biased and inconsistent parameter estimates. Tobin developed the Tobit model to solve this problem. We used the Tobit model to analyze the factors that affect the income change.

The basic form of the Tobit model is

$$y_i^* = \beta' x_i + \varepsilon_i \tag{5}$$

$$\begin{cases} y_i = 0 & if \quad y_i^* \le 0 \\ y_i = y_i^* & if \quad y_i^* > 0 \end{cases}. \tag{6}$$

To analyze the income change, we defined y_i^* as difference between the logarithms of the earnings before and after being laid-off.

$$y_i^* = \log(Nl\,earn_i / Learn_i) \tag{7}$$

The basic assumption of formula (6) is that, if laid-off workers are reemployed, their earning have changed. That is,

$$\begin{cases} y_i = 0 & if \quad Nlearn_i \le 0 \\ y_i = y_i^* & if \quad Nlearn_i > 0 \end{cases}. \tag{8}$$

We used the probit model to estimate the probability that the laid-off workers were reemployed. Since we did not collect data about the workers during their unemployment, we could only use the data we collected about them for the period before they were laid off to analyze the factors that affected their chances of being reemployed. Similar to our analysis of the factors that affected the unemployment duration, we classified the factors into two groups. In one group were the factors that affected the opportunity that the laid-off workers accepted. It mostly contains variables reflecting the basic information about the workers and their experience before being laid off. In the other were exterior factors that affected their new employment opportunity.

First we consider the characteristic variable of the original enterprise. Whether laid-off workers find reemployment was formulated as

$$\Pr ob(Nlearn_i > 0) = \gamma' z_i + \mu_i \quad , \tag{9}$$

where z_i = (Gender, Age, Fage, School1, School2, Mstatus, Genderm, Fsize, Fform, Findu, Fcond, Ffoun, Ljob, Lexp, Lpos, Lstat, Learn).

With respect to the factors that affect the income after reemployment, except for the two factors above, we also considered the properties of the enterprise after reemployment and the effects of these properties on the income change. The resulting model is formulated as

$$\log(Nlearn_i / Learn_i) = \alpha + \beta' x_i, \tag{10}$$

where x_i = (Gender, Age, Age2, Fage, School1, School2, Mstatus, Genderm, Ljob, Lexp, Lpos, Nfsize, Nfform, Nfindu, Nfcond, Nffoun, Nljob, Nlexp, Nlpos, Nlstat)

The basic meanings of the variables above are presented in Table 1, and their basic sample statistics are summarized in Table 2.

5.2. Parameter Estimation

The model described above and a censored sample were used to estimate the maximum likelihood for the variables affecting the income change. The results are shown in Table 4.

The personal information on the laid-off workers (Gender, Age, Age2, Fage) significantly affected the income change. For example, the older workers tended to have a lower income after reemployment, but the difference gradually decreased with an increase age. Additionally, the women tended to have a lower income after reemployment, particularly the older ones.

The regression coefficients for the education levels (School1, School2) were not significant; the one for Lexp was significantly less than zero.

The workers who obtained a skilled job tended to have a higher income than before while the ones who obtained a management or other type job had about the same income.

The regression coefficients for the size of the new enterprise (Nfsize) and the founding date (Nffoun) were significantly less than zero. This indicates that the laid-off workers who found employment in a smaller enterprise tended to have a lower income. This is attributed to smaller enterprises having lower wage levels. The workers who found employment at enterprises founded before 1978 tended to have lower income. This is attributed to enterprises founded before 1978 having lower wage levels than those founded after 1978.

Table 4. Estimated results for income change

Heckman selection model (regression model with sample selection)

Number of observations = 1212

Censored observations = 641, Uncensored observations = 571

Log likelihood = −970.2942

Log($Nlearn_i/Learn_i$)			Select (Prob($Nlearn_i > 0$))		
Explanatory variables	Estimated coefficients	Z value	Explanatory variables	Estimated coefficients	Z value
Gender	−0.541*	−1.885	Gender	−0.353	−1.086
Age	−0.101**	−2.548	Age	−0.121"""	−5.181
Age2	0.002**	2.941	School1	0.071	0.631
Fage	0.015*	1.900	School2	0.342"	1.762
School1	−0.055	-1.152	Mstatus	−0.191	−0.818
School2	0.080	1.061	Genderm	−0.561"	−1.678
Mstatus	0.055	0.628	Fsize	−0.021	−0.190
Genderm	−0.014	−0.108	Fpor	−0.012	−0.152
Ljob	0.141**	3.032	Findu	−0.039	−0.447
Lexp	−0.024**	−2.547	Fcond	−0.215""	−2.523
Lpos	0.041	0.058	Ffoun	−0.205"	−1.823
Nfsize	−0.155***	−3.334	Ljob	−0.288"""	−2.819
Nfform	−0.108	−1.555	Lexp	0.106"""	5.188
Nfindu	−0.012	−0.323	Lpos	−0.068	−0.544
Nfcond	−0.004	−0.049	Lstat	−0.056	−0.684
Nffoun	−0.212***	−3.445	Learn	−0.001"""	−6.693
Nllenth	0.114***	8.276	Const.	4.937"""	7.407
Nljob	−0.066*	−1.807			
Nlpos	0.348***	8.006			
Nlstat	0.010	0.081			
Const.	2.061**	2.711			

LR test of indep. eqns. (rho = 0); Wald chi2(22) = 240.48; Prob > chi2 = 0.0000

Note: *, **, and *** indicate significance level of 10, 5, and 1%, respectively.

The regression coefficient for work time in the new enterprise (Nlenth) was significantly more than zero. And, the laid-off workers who found employment as managers tended to have increased income. In contrast, those took skilled jobs tended to have reduced income.

6. Conclusion and Recommendations

Using the hazard function and a limited dependent variable model, we analyzed the factors that may affect the unemployment duration of laid-off workers in the Beijing area and the difference in income before being laid off and after reemployment.

Age was found to have significantly affected not only the unemployment duration, but also the income change. While gender did not affect the duration, it did affect the income change. Analysis of the factors that affected the duration revealed that the duration for workers laid off by enterprise with bad benefits tended to be longer. It also revealed that workers who were permanent employees or had a long-term contract with their previous enterprise had longer unemployment duration than those who had a short-term contract.

From the results above, we can draw a primary conclusion: workers who are older women, especially those who are married, will consider the cost of finding a new job and the opportunity cost of reemployment (such as the allowance for unemployment, the cost of family labor, the mental pressure of finding a new job, and the mental pressure of the works. If these costs exceed the benefits of reemployment, they will tend to reject the reemployment opportunity; however, they do not give up their laid-off status and do not withdraw from the labor market. They hold on to their laid-off status as long as possible due to the benefits, such as the allowance, special treatment for housing, and medical insurance. These benefits reduce the motivation of laid-off workers who are older or who are married women to find new employment.

Given these conclusions, we can say that, although the special layoff policy has promoted the establishment of a labor market to some extent, it has been an obstacle to labor-marketing because it tends to prolong the time laid-off workers are out of work. Moreover, if the condition of the original enterprise is bad and it does not have sufficient capacity to help its laid-off workers find reemployment, and since it has to shoulder the burden of providing an allowance to the laid-off workers, its condition will become worse and worse. This will make it more difficult to set up and improve a system of unemployment benefits under the market economic system.

Governments of countries transitioning from a planned economic system to a market-oriented one are often skeptical of the role played by the market and tend to rely more on administrative decrees than market forces when problems occur during the transition. As shown by the current analysis, a typical example of this is China's special lay-off policy, which we consider a failure. Although administrative decrees regarding laid-off workers initially played a positive role in the downsizing of the state owned

enterprises, as unemployment increased, the labor markets could not keep up. Moreover, the policy did not cultivate a competitive mindset in the SOEs. A more effective policy would be for the government to provide subsidies to enterprises employing laid-off workers and for job training of laid-off workers. Adoption of such policies would promote the role of the labor markets and make better use of the market mechanism.

Analysis of the factors that affected the unemployment duration also revealed that the lower the education level, the longer the duration, the longer the work experience, the shorter the duration (even if the experience was all at one enterprise), and the higher the income before being laid-off, the shorter the duration.

Analysis of the factors that affected the income change revealed that the longer the time worked at the original enterprise, the lower the income level after reemployment and the longer the time worked at the new enterprise, the higher the income level. From these results, we can draw a general conclusion related to labor economics. Because information about the labor market is asymmetrical, when a laid-off worker finds a new job, the education level, work experience, and ability of the worker becomes important information to the new enterprise. On the other hand, a part of the human capital that was accumulated through previous experience is a firm specific skill, and the longer the time worked at the original enterprise, the larger the proportion of the firm specific skill to the human capital. Consequently, the new income is less than the previous one. Nevertheless, as the time worked at the new enterprise increases, the worker's capacity gradually improves, and the income naturally increases.

From the analysis of the factors that affected the unemployment duration, we found that whether a worker had a skilled job or a management job before being laid off did not significantly affect the unemployment duration. In addition, from the analysis of the factors that affected the income change, we found that the workers who accepted a skilled job, tended to have a higher income than before. In contrast, the workers who accepted a management or other job tended to have about the same income as before.

From these results we can say that if the industry structure changes (for example heavy industry or labor intensive industry decrease), demand of labor also changes. During the job search, the past experiences nor skills are not be advantage. The knowledge and skills which laid-off workers obtained former enterprises do not have important conditions.

For the economic system transition, the management experience gained under the planned economic system can not be regarded as an efficient information that the market economy. Therefore, in comparison with the other types of workers, they do not have the advantage of the know-how during the job search. Then the management knowledge and

experience they gained have not entirely accommodated to the market economy. In comparison to the workers who did not find a management job, they do not have the advantage of the management skill under planed economic system, and their income change is insignificant. This tells us that the management knowledge and experience obtained under the planed economic system are not entirely accommodated to the work demand under the market economic system.

To help more laid-off workers find new jobs, the government must reeducate them so that they can adapt to the new economic environment and it must teach them the skills workers normally acquire under a traditional economic system, especially those who worked as managers. In a word, it is necessary to reeducate not only their skills but also the way of thinking and the knowledge structures to make it adjust to work in the enterprise in the market economy.

The duration of the unemployment in the manufacturing was longer. This shows that the lay-off of many redundant workers was not only due to the economic transition, but also to changes in China's industrial structure. That is, the lay-off was also a special phenomenon—they reflected the structural unemployment inherent in the planned economic system. This means that the government must implement a more active employment policy, including providing more support for professional training and promoting the creation of private enterprises that can effectively support such training.

Although we did not collect information on the laid-off workers during their period of unemployment, we estimated that some of them had been "under employed" or "invisibly employed" during the time they were searching for a new job. The unemployment duration (or the job-search activity) was probably affected by the earnings from this under or invisible employment. Unfortunately, we were unable to analyze this factor. In addition, we were unable to analyze the human capital for the reemployment quality of the laid-off workers. To do this, we need to investigate the relationship between the characteristics of the new job and the past experience. These tasks are left for future study.

References

1. Dong, X. and Putterman, L., "Investigating the Rise of Labor Redundancy in China's State Industry", *China Economic Quarterly* (*in Chinese*), 2002, 1, 397–417.
2. Greene, W. H., *Econometric Analysis*, 4th ed. Prentice-Hall, 2000.
3. Academy of Macroeconomic Research, National Development and Reform Commission, P. R. China, "China's employment situation during 1999 to 2001 and a study of related policies", *Management World (in Chinese)*, 1999, 4, 71–81.
4. State Statistical Bureau, P. R. China, China Labor Statistical Yearbook, 1997 to 2001, China Statistics Press.
5. Ham, J., Svejnar, J., and Terrell, K., "Unemployment and the Social Safety Net During Transitions to a Market Economy: Evidence from the Czech and Slovak Republics", *American Economic Review*, 1998, 88(5), 1117–1142.
6. Hu, Angang. "An Analysis of the Status of Unemployment in China's Towns and Cities", *Management World (in Chinese),* 1998, 4, 47–63.
7. Kiefer, N., "Economic Duration Data and Hazard Functions", *Journal of Economic Literature,* 1998, 26, 646–679.
8. Lancaster, T., *The Econometric Analysis of Transition Data*, Cambridge, 1990.
9. Qiang, L., Junsheng, H., and Dayong, H., *A Comparative Analysis of Unemployment and Laid–off*, 2001, Tsinghua University Press.
10. 10. Mortensen, D. T, "Job Search and Labor Market Analysis", *Handbook of Labor Economics,* 1986, 2, 849–919.
11. Rong, M. and Wei, Y., "A Study to Increasing Job Opportunities of laid-off workers", *Management World (in Chinese),* 2001, 2, 88–94.
12. Svejnar, J., "Labor Markets in the Transitional Central and East European Economies", *Handbook of Labor Economics,* 1999, 3B, 1809–1857.
13. Institute of Labor Science, "A Study on Labor Relations of Laid-off workers and State-owned Enterprises", *Management World (in Chinese)*, 2000, 1, 104–110.
14. Chinese Academy of Sciences, Report of State of the Nation, No. 6, Employment and Development, 1998, Liaoning People's Publishing House.
15. The Team of Study for China's Cities and Towns Labor Mobility, "Labor Market Structure and Labor Mobility in China", *Management World (in Chinese),* 2002, 3, 74–79.

Received 18 January 2008; accepted 21 April 2008